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Disasters, Deaths, and the Sendai Goal One: Lessons from Odisha, India

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SUMMARY

Natural disasters (such as floods, cyclones, heat waves, and lightning) have the potential to cause human loss and injury. Due to climate change, the number of people affected by natural disasters is increasing every year with a marked debilitating effect on developing countries as compared to developed countries. To tackle these challenges, the United Nations "Sendai Framework for Disaster Risk Reduction 2015–30" identified "seven global targets", of which the first target is to "substantially reduce global disaster mortality by 2030". This research contributes to this emerging domain of knowledge by bringing gender disaggregated mortality data from 1999 to 2013 from an Indian state called Odisha. In doing so, this research brings three questions to the fore: first, why do deaths occur in disasters? This is answered by going beyond the traditional perspectives on risk and vulnerability to include a "complex perspective" developed from the theories of organization, violence, and justice. Second, who is responsible to reduce deaths and third, how deaths get recorded and reported? Based on a review of annual death reports, census data, and seven expert interviews, findings suggest that the current disaster management system in Odisha is not accountable and the death reporting and recording system merits change in order to be consistent with the Sendai's Goal to reduce deaths. This study posits that complex perspective has the potential to improve disaster management system by shifting the attention from "at risk" community to the actors and organizations' and to the necessary resources and measures that will be required to reduce deaths in resource poor contexts.

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1. Introduction

Natural disasters (such as floods, cyclones, typhoons, heat waves, and lightning) have the potential to cause human loss and injury. The number of people affected by natural disasters is increasing every year, with a marked debilitating effect on developing countries as compared to developed countries (Coppola, 2011; DFID, 2013). During 1980–2000, 53% of the deaths due to disasters occurred in poor countries, although these countries accounted for only 11% of the world's "at-risk" population (Coppola, 2011). During 2000–04, "on an average annual basis one in 19 people living in the developing world was affected by a climate disaster" in comparison to "one in 1,500 affected" in the Organisation for Economic Co-operation and Development (OECD) countries—"a risk differential of 79" (UNDP, 2007, p. 76). It is estimated that by 2080 the number of additional people at risk of hunger due to disasters could reach up to 600 million (Hansen, 2007)—twice the number of people living in poverty in the Sub-Saharan Africa today. By 2050, "natural disasters could have a global cost of over $300 billion a year" (HPN, 2007) because global warming and climate change is likely to increase the frequency of abnormal weather events and disasters (Flatø, Muttarak, & Pelser, 2017). To tackle *these current and forthcoming challenges*, The United Nations' Sendai Framework for Disaster Risk Reduction 2015–30 (successor of the "Hyogo Framework for Action 2005–15") identified seven global targets, of which the first target is to: "Substantially reduce global disaster mortality by 2030" (UN, 2015, p. 12). This is welcome news because it will lead to new actions, funding, and research. It will also lead to systematic collection of mortality data at national and international levels, which is currently lacking. This research contributes to this emerging domain of knowledge by bringing mortality data from an Indian state called Odisha. Based on the collection and analysis of this data, this research identifies novel theoretical perspectives and practical measures that will be required to reduce deaths in resource-poor contexts.

2. Deaths and disaster perspectives

This section engages with one of the pertinent questions: why deaths occur in disasters. Although research that scrutinizes the causes for men and women's deaths in disasters is rather limited, it usually relies on one of two perspectives: traditional

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(or risk-based) and vulnerability (Kapur, 2010). Both perspectives are analytically different but in practice they are related. An additional "complex perspective" is also suggested to explain why deaths continue to occur. This complex perspective is built from the tenets of Sen's "theory of justice", violence and organizational theories. This additional perspective adds new layers of understanding to risk and vulnerability perspectives to understand the reasons for deaths, as well as identify measures to reduce them in resource-poor contexts.

(a). Traditional perspective

The traditional perspective is the most dominant and mainstream perspective. According to this perspective, natural hazards originate from natural systems and they can cause harm and loss. One way of mitigating the effect of nature is through technology or a "technical fix" (Ariyabandu & Wicramasinghe, 2003; Bryant, 2005; Ray-Bennett, 2009a; Wisner, Blaikie, Cannon, & Davis, 2004). This line of thinking was dominant in the UN's General Assembly Resolution 44/236, adopted on 22 December, 1989. Four out of five of its goals underlined the importance of the dissemination of technical information and the transfer of scientific and engineering knowledge for the mitigation of disasters in developing countries (Bankoff, 2001; de Senarclens, 1997). As a result, structural mitigation measures, such as building concrete houses, flood levies, ocean wave barriers, cyclone shelters, embankments, and dams, attained primary importance over non-structural mitigation measures, such as policies, laws, training, raising public awareness, and aid—among many *(Davis & Gupta, 1991; Haque & Zaman, 1994; Kaiser, Spiegel, Henderson, & Gerber, 2003; Thomson & Penning-Rowsell, 1994; Zaman, 1999)*. This technical perspective has evolved due to the mid-term evaluation of the International Decade for Natural Disaster Reduction (IDNDR) (1990–2000) in 1994 (known as Yokohama Strategy) followed by the Hyogo Framework for Action (2005–15) and most recently the Sendai Framework for Disaster Risk Reduction (2015–30) (UN, 2005; UN, 2015). Now there is widespread acknowledgment that hazards can include "latent conditions that may represent future threats and can have different origins: natural (geological, hydrometeorological and biological) or induced by human processes (environmental degradation and technological hazards)" (UNISDR, 2015a, p. 3/25).

Despite these changes, governmental organizations often use natural causes or the geophysics of a hazard to explain deaths in disasters. This is noted by Kapur (2010) while reviewing the effects of 16 natural hazards[1] on human deaths from 1977 to 2002 in India. Geophysics of a hazard can be understood in three ways: first, higher the intensity of a hazard, the more likely it is to kill people. Intensity is classified as moderate or severe for 11 hazards out of 16. Of the 11 hazards, cyclones had killed more people in India. Second, hazards are seasonal and so are human deaths. In India, the month of November is cyclone-prone, May is prone to gale and dust storms, April for hailstorms, June for lightning, and January and February for cold snaps. It was noted that 32% of cyclones occurred in the month of November and 36% of all deaths due to disasters were in this month. Third, the effect of hazard is spatially determined and so are the deaths due to disasters are spatially varied. India is diverse and different regions are exposed to different types of hazards. For instance, the coast of Bay of Bengal is exposed to severe cyclonic storms, whereas the north-west is exposed to droughts. Almost one half of all deaths in the Bay of Bengal were due to cyclones compared to the west coast of India (Kapur, 2010).

[1] The 16 natural hazards are: cloudburst, cold wave, drought, dust storm, earthquake, flash flood, gale, hailstorm, heat wave, lightning, snowfall, squall, thunderstorm (Kapur, 2010).

This perspective provides an excellent insight into the dynamics of geohazards and their effect on humans. As a result, national and international organizations are investing heavily to build the capacity of the experts and practitioners by embracing state-of-the-art technologies, such as space technology and multi-hazard early warning systems in order to promote effective disaster management system to reduce deaths (UNISDR, 2015b; WMO, 2017a). However, in the context of this research, this perspective explains little as to why more women die in disasters than men or vice versa.

(b). Vulnerability perspective

The vulnerability perspective, on the other hand, aims to explain why some people are more vulnerable to disasters than others. Vulnerability is often used in different ways (Bacon, Sundstrom, Stewart, & Beezer, 2017) but in this instance, it is understood as "*the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard* (an extreme natural event or process)" (original emphasis by Wisner *et al.*, 2004, p. 11). According to this perspective, the impacts of natural disasters are not entirely "natural", rather they are determined by people's unequal exposure to risks which are a consequence of the socio-economic systems (Cannon, 1994; Neumayer & Plümper, 2007). The significance of natural hazards as trigger-events is not denied by this perspective, but emphasis is placed on the various ways in which social and economic systems can render people more vulnerable to disasters (Cannon, 1994; IPCC, 2012; Varley, 1994; Winchester, 2000; Wisner *et al.*, 2004). In this perspective, the normal daily lives of some vulnerable groups are often difficult to distinguish from disaster conditions. Disasters only act as an interface between an extreme physical environment and a vulnerable group of the population, due to a "combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk" (Sivakumar 2005, p. 2). According to this perspective, differences in mortality to natural disasters are explained due to biological vulnerability, social and cultural vulnerabilities (caste, race, gender, and age), economic vulnerability (class) and physical vulnerability (housing structures). These vulnerabilities are not distinct; they often are conjoined and reinforce each other during the time of disasters. This is evident in the discussion below.

Biological and physiological differences between men and women put women at higher risk during disasters (Neumayer & Plümper, 2007). Men in general are physically stronger than women and therefore they are likely to withstand the impact of a disaster better than women. For instance, a physically robust man has a better chance to swim or climb up a tree in order to survive against an emerging storm surge. However, biological and physiological differences may also be socially determined. Social and cultural norms related to role behavior put women more than men at a greater risk when it comes to rescue efforts (Neumayer & Plümper, 2007). Dress codes such as *saree* or *burqa* were found inhibiting women's mobility during the 1991 cyclone in Bangladesh. Learning to climb a tree or swimming are something that are socially not permissible in some societies. In Sri Lanka, a study conducted by Centre on the Epidemiology of Disaster (CRED) (2006; quoted in Eklund & Tellier, 2012) noted that only 12 to 20% of women were able to swim compared to 75 to 85% of men. In the response phase of a disaster, the lack of lifesaving skills along with the responsibility of looking after young children often put women at a greater risk to disasters (Eklund & Tellier, 2012; Neumayer & Plümper, 2007). A report by the WHO (2002) noted that although the Indian Ocean Tsunami in 2004 claimed 300,000 lives across 13 nations, 80% of this was women and children. The

Indian Meteorological Department found that a large proportion of women (34%) and children (45%) were killed in disasters in comparison to men (21%) during 1977–2002 (Kapur, 2010). Flatøet al. (2017) highlight that gender inequality can increase due to climate-related disasters, especially with marginalized groups, such as women–headed households. They also conclude that females' "position in the labor market and society in general is one of the burdens which may cause differential vulnerability" (Flatøet al., 2017, p. 53). Neumayer and Plümper's (2007) research of 141 countries during 1981–2002 showed that natural disasters lower the life expectancy of women more than that of men. In other words, natural disasters (and their subsequent impact) on average kill more women than men and kill women at an earlier age than men. Women's mortality rates are also much higher in developing countries in comparison to their developed counterparts (Lass, Haas, Hinkel, & Jaeger, 2011; Neumayer & Plümper, 2007).

Social stratification based on class and race can be highly detrimental in putting some lives at risk during disasters (Barnshaw & Trainor, 2007). An individual's class and race often determines the choice one can make and the social capital they can acquire in their everyday lives. Social choices and capitals are critical assets to build individual's agency and social networks. Vulnerable groups often lack agency due to structural inequalities and a lack of social resources that exists in their everyday lives. In this vein, communities with stronger social networks will be in a better position to evacuate and even survive a disaster. In contrast, communities which are not will be more susceptible to the impacts of the disaster. For example, higher numbers of poorer African-Americans were the victims in Hurricane Katrina compared to their white middle class counterparts because they lacked social capital in their everyday lives (Barnshaw & Trainor, 2007).

Caste and class is an equally important determinant in the Indian Subcontinent for gender differences in disaster mortality. In fact, the relationship between caste, class and gender in Indian society cannot be understood outside a consideration of their mutual impact (Chakravarti, 2003); they are intertwined and interlinked, creating and reinforcing inequality (Sen, 2005). Caste, class, and gender issues were noted by Ray-Bennett (2009a, 2009c) in the Super-Cyclone of 1999 in the village of Tarasahi, Odisha. She found woman–headed households from the upper and middle castes were better able to survive the Super-Cyclone than their low-caste counterparts. This was because the low-caste women lacked social support. Their houses were also not made from concrete and were located in the low-lands which were the first to get flooded. Lack of evacuation shelters further exacerbated the predicament of the low-caste women. The low-caste respondents survived the impact of the Super-Cyclone by tying themselves onto a coconut tree, squatting for more than 10 h by holding hands tightly with their neighbors under a plastic sheet, and others survived by sitting on the veranda of a rich upper caste household and of the public-school buildings.

In addition to the social and cultural vulnerabilities, physical vulnerability can also lead to gender differences in mortality. Kapur (2010) argued that greater numbers of women's deaths occurred in the 1993 Latur Earthquake in India due to the nature of house structures. Higher numbers of deaths were recorded in stone and mud houses (86.32%) compared to shacks (0.40%) and brick and mortar (1.15%). Although poor households owned mostly the stone and mud houses and therefore bore the severe brunt of the Earthquake, it is important to note that not all the poor suffer, because the households living in shacks were the least affected. This indicates that poverty and disaster vulnerability are linked but they are not the same (Cannon, 1994; Jaspars & Shoham, 1999; Ray-Bennett, 2009a). The correlation of vulnerability and poverty is highly significant, but concomitantly failure to distinguish vulnerability from poverty has severe policy implications because poverty is endemic and defined by professionals in terms of flows of income and consumption (Chambers, 1989). Anti-poverty programs tend to concentrate on raising incomes or consumption and progress is measured according to these flows, which are then often taken as indicators of other dimensions of deprivation, including vulnerability (Chambers, 1989). Poverty is largely a consequence of class and social position and in itself provides an inadequate explanation of the differential impact of hazards (Cannon, 1994; Ray-Bennett, 2009a). In this light, men and women's deaths in disasters when attributed to their class and social vulnerabilities cannot be accepted uncritically—other vulnerabilities play a part too.

Table 1
Typology of organizations and actors

Organizations	Actors
Primary[1]	Category 1 responders and affected community
Secondary[2]	Category 2 responders
Tertiary[3]	Global responders

[1] Primary organizations are the first responders. They are also known as Category 1 responders by the Civil Contingency Act in the UK (Walker & Broderick, 2006).
[2] Secondary organizations are decision making organizations at national and state levels.
[3] Tertiary organizations are multi-lateral or global organizations (such as the UN or World Bank).

Vulnerability perspectives played a crucial role in changing theory and practice related to disaster risk reduction (DRR) (Enarson, 1998; UN, 2005). However, a limitation of this perspective, in the context of this research, is its over-emphasis on the vulnerabilities of communities "living with" or "at risk" rather than the organizations and professionals who are involved in the day-to-day "messy" business (Schön, 1983) of averting disaster risks (Ray-Bennett, Mays, Shiroshita, & Jackson, 2015). As a result, understanding organizational vulnerabilities that can manifest through inaction (Aalst, Kellett, Pichon, & Mitchell, 2013; Chatterjee, Gupta, & Jain, 2010; The National Diet of Japan, 2012; UNISDR, 2006), human errors (Perrow, 1999; Reason, 1990), mismanagement (Toft & Reynolds, 2005), lack of coordination, communication (Chatterjee *et al.*, 2010; Prizza, 2007; Srivastava, 2009; Weick, 1990), hierarchy and other features (Weir et al., 1996) in national and local authorities, non-governmental organizations and environmental agencies has received far less attention by the DRR community (DFID, 2006; DFID, 2012). As such, human deaths can occur also due to vulnerabilities that exist in human built organizations[2] (Perrow, 1999; Weick, 1990) such as a disaster management system. This is explained through the lens of a "complex perspective" below.

(c). Complex perspective

According to the complex perspective, a disaster management system is a conglomeration of different professional groupings and actors designed for specific tasks and goals. This will be evident later in the description of the disaster management system in Odisha. Actors and organizations involved in disaster management belong to linear systems which are spatially segregated (Perrow, 1999). For instance, disaster management involves multiple agencies across the public, private, and voluntary sectors at local, regional, national and global levels. These organizations are diverse, hierarchical and interdependent. A typology of these

[2] "Organisations are social designs directed at practice" (Wenger, 1998: 241). In other words, organizations are combination of institutions (social design) and constellation of practices by different actors which gives life to the organization (Wenger, 1998).

organizations is provided in Table 1. They have dedicated connections, and have extensive understanding of the nature of risk (such as cyclones/flooding) (Perrow, 1999). They are also highly complex in their structures and processes of work. At the outset, they may look like separate entities but in reality, they are highly interdependent (Weick, 1990). In this context, deaths from disasters are a complex problem because the decision to save lives during disasters sits across many governmental departments and institutions (Grint, 2008; Rittel & Webber, 1973). Unfortunately, these complexities have remained unexplored by the risk and vulnerability perspectives. Vulnerabilities of actors and organizations that exist at the seams of the disaster management system are explained further through the prism of violence and Sen's "theory of justice.[3]"

It is argued most of the deaths in disasters are "avoidable" due to the advancements in weather forecasting systems (DLR, 2013; Galtung, 1969; Glantz, 2009), human-built environments (Lalonde, 2011; UN, 2005) and economic and policy development worldwide (Farmer, 2003; Sen, 2003; UN, 2015; UNISDR, 2015a, 2015b). Nonetheless, avoidable deaths continue to happen despite these advancements. According to Roberts (2008, p. 9), avoidable deaths are not accidents, "but are instead end points in a causal chain created by human beings". Paul Farmer, a renowned medical anthropologist, calls these preventable deaths "stupid deaths" (Whiteford, Rylko-Bauer, & Farmer, 2009). When these stupid deaths continue to occur, they become "violence" (Galtung, 1969; Farmer, 2003; Rylko-Bauer, Whiteford, & Farmer, 2009) or, in the case of disasters, a concept which is coined here as "event violence". Event violence occurs because of pre-existing social vulnerabilities– described above, and the structures and processes of neo-liberal financial institutions in the developing nations (Roberts, 2008). Societal and financial structures and processes often perpetuate existing vulnerabilities (Galtung, 1969; Roberts, 2008). Cockburn (2004) calls this a "continuum of violence" which gets magnified during war, military violence or, in the case of this research, during natural disasters. Violence against women and men continues even in the absence of war and during peace (Giles & Hyndman, 2004) in varied forms, including underemployment, low wage, wage gap, lack of investment on health, education and disaster management, lack of social protection policies for the poor and vulnerable—to mention a few. Organizations (both governmental and non-governmental) that manage and mitigate disaster risks often contribute to these vulnerabilities either by overlooking pre-existing vulnerabilities or by not taking appropriate actions to reduce them. These pre-existing vulnerabilities exacerbate the impact of disasters and violence by causing human loss and injury and injustice for the deceased.

According to Sen (2009), deaths in disasters are a case for violation of justice. In the event of disasters, justice is denied to those women and men who would have otherwise lived a long and an accomplished life (Sen, 2009). Here the disaster becomes a case of injustice because human deaths could have been prevented by undertaking preventive actions, but the relevant actors and organizations of the disaster management system have failed to protect lives (Arendt, 1970; Farmer, 2003). When precious lives are lost, Sen argues that these deaths are "intolerable injustices". Intolerable injustice requires an "overwhelming priority" without "requiring the search for a consensus on what a perfectly just society would look like" (Sen, 2009, p. 21). Intolerable injustices are the manifestation of human systems failure, and they can be rectified.

How then would justice be advanced for human lives in disasters? Three arguments are suggested for this. First, human deaths must be identified as a matter of justice. Deaths in disasters can be reduced given the sophistication that has been achieved in science, technology, policy and planning, yet deaths continue to occur. Accordingly, avoiding deaths should receive a high priority in order to address this injustice. One way of prioritizing this is to develop a "goal" to reduce deaths for the entire disaster management system, which is discussed later in the case of cyclone Phylin in 2013 in Odisha.

Second, Sen's (2009, p. ix) theory of justice also clarifies "how we can proceed to address questions of enhancing justice and removing injustice, rather than to offer resolutions of questions about the nature of perfect justice". This approach is empowering in the sense that enables suggestions to improve the disaster management system for developing countries in general, rather than demanding a complete state of development through transcendental institutions or a just society. As such, problems can be framed as well as solved within the disaster management system.

Third, and most importantly, Sen's (2009, p. 18) theory of justice is focused on social realization "which goes well beyond the organizational picture and includes the lives that people manage or do not manage to live". Social realizations are "assessed in terms of their utilities or happiness [...] [and] the substantive freedoms that people enjoy". This should certainly make organizations and actors *accountable* for what they do, or do not do, to save lives. This is because social realizations are based on a "capability perspective[4]"—"one that can make room for demands of duty" (Sen, 2009, p. 19) from the actors and organizations who have failed to protect or save human lives. The issue of accountability is still in its nascent stage[5] among the DRR community since disaster risk management involves plethora of actors and organizations as identified above. As such, making actors accountable is difficult, particularly considering the poor death reporting systems which are complicated by local context and cultural norms. This is illustrated through the case of Odisha in India.

3. Odisha: the land of multiple disasters

Odisha (renamed from Orissa in 2011) sits on the coast of the Bay of Bengal. According to the 2011 census, the population of Odisha was at about 41 million, which makes it the 11th most populated state in India (Census of India, 2011). Bhubaneswar is the capital city of Odisha. In total Odisha has 30 districts of which 13 are coastal (Census of India, 2011; Samal, Meher, & Panigrahi, 2003). The coastal districts are highly prone to cyclones, floods, droughts and heat waves due to its geographic location (Bhatta, 1997; GoO, 2002a; Ray-Bennett, 2009a). Its coastline adjoins the Bay of Bengal (485 km), which makes it four to five times more likely to experience storms than it would if it was located in the Arabian Sea (Kalsi, 2003; Shiva & Emani, 2000). Tropical cyclones from the Bay of Bengal bring severe and widespread destruction, especially when accompanied by storm surges, high winds and extreme rainfall that results in riverine flooding (GoO, 2002a, 2002b). Odisha's Super-Cyclone of 1999 which killed more than 10,000 people was one of unparalleled intensity and devastation. In contrary, Odisha was affected by another cyclone called Phailin in 2013, with only 86 people killed.

[3] Sen's theory of justice is based on the 'alternative theories' of justice spearheaded by Smith, Bentham, Mill, and Wollstonecraft—to mention a few. They differ from the mainstream political philosophers such as Hobbes, Rousseau, Kant, Locke, Rawl—to mention a few—on three grounds: (i) contractarian *vs.* comparative; (ii) arrangement-focussed *vs.* realization focussed; (iii) just institutions (transcendental institutions) *vs.* different ways in which people live may be led or influenced by institutions and individual's behavior (for detailed discussion, see Sen, 2009).

[4] Capability is the power to do something whether this is related to evacuation prior to a disaster or being able to be well nourished or healthy in everyday life.

[5] The author is currently co-authoring UNISDR's Guidelines on 'Words in Action: Accountability in the Context of Disaster Risk Governance'.

Apart from cyclonic exposure from the Bay of Bengal, the people of Odisha are subject to the vagaries of complex river systems. Flood is therefore another major concern in the state. The major rivers predominantly responsible for flooding are: Mahanadi, Baitarni, Brahmani, Kathjori, and Subarnarekha (Bhatta, 1997; GoO, 2005; Ray-Bennett, 2009a). These are all affected by heavy rainfall in the upper catchment area which, along with unusual monsoon rainfall, causes them to flood. The problem is further exacerbated when floods coincide with high tides. These block the floodwater from exiting into the sea, having a further devastating effect on low-lying coastal areas. Drainage congestion is an increasingly major contributor to the problem of flooding in certain parts of coastal Odisha. The entire low-lying coastal belt, already highly prone to cyclones and storm surges from the Bay of Bengal, and annual monsoonal rainfall, has these problems compounded through the ever-increasing siltation of the river beds (Bhatta, 1997; GoO, 2005; Ray-Bennett, 2009a).

Drought is another perennial problem in the coastal and western areas of Odisha. Approximately 70% of the total cultivated area of the state is prone to drought (GoO, 2005). These areas also lack irrigation facilities; only 14% of the state has irrigation provisions, despite the fact that Odisha is an agro-based economy (Pradhan, 2003; Ray-Bennett, 2009a). The dependence of agriculture on rain means that the slightest variation in rainfall makes drought a constant hazard. In addition to the cyclones, floods, droughts, Odisha is prone to heat waves and lightning as noted previously. The geographic and climatic conditions of Odisha have led to it experiencing multiple disasters causing recurrent physical and social destruction for people's lives over a sustained period of time.

4. Methodology

The fieldwork was conducted in three phases over a period of one year (August 2013 till August 2014). In the first phase, death records of 30 coastal districts were reviewed. The timeline for review was from 1999 to 2013. Although there are a plethora of data available on the frequency of disasters and deaths due to disasters from 18th Century to 1999 (see Bhatta, 1997; GoO, 2002a; Ray-Bennett, 2009a; Samal *et al.*, 2003; Swain, Swain, & Sahoo, 2006), there are much less data available in the post Super-Cyclone phase. This study's compilation of data is therefore unique. Annual death reports, official magazines, and census data from the offices of Odisha State Disaster Management Authority, Special Relief Organisation and the Indian Meteorology Department/Odisha in Bhubaneswar were systematically reviewed. These data provided a snapshot of human deaths against six climatic hazards identified by the Government of Odisha from 1999 to 2013. Findings of this review are provided in Table 2 below.

In the second phase, disaggregated mortality data were collected from the block and district level offices of four districts: Cuttack, Puri, Jagatsinghpur and Ganjam. Ideally more districts could have been selected but this was limited due to funding constraints. The selection of the sampled districts was both purposive and convenient (Bryman, 2001). All these districts experienced the Super-Cyclone and Cyclone Phailin. They were the worst affected districts in comparison to the remaining nine coastal districts and thus, these districts were selected for this study. They were also the largest districts in terms of population size. Besides, the research team had good knowledge of at least two districts, Jagatsinghpur and Cuttack, because of their previous work in Odisha. This background knowledge was important when designing the research process. Furthermore, the willingness of the District Emergency Offices to partake in this research was also critical to selecting these districts.

To verify the death data, seven interviews were conducted with the government officials in the third phase. This included the Director of Indian Meteorology Department, Deputy General Manager of Odisha State Disaster Management Authority, Deputy Relief Commissioner of Special Relief Organisation, State Programme Officer of United Nations Development Programme Office and three District Emergency Officers of Jagatsinghpur, Puri and Ganjam. All these respondents were senior and elite bureaucrats and had extensive operational knowledge on disaster management issues. Formal interviews were recorded using the software MyMemos. The interviews lasted between one to three hours and the respondents spoke largely in English with a few words in Oriya and Hindi. In light of the three phases discussed above, records/reports, secondary literature and formal and informal interviews were triangulated to enhance quality of the collected data[6] (Burgess 1991).

5. Findings

(a). Cyclones and lightening are major killers

Table 2 provides the exact number of deaths that occurred in the 30 districts of Odisha from 1999 to 2013. Of the 14,055 deaths, 2,439 deaths were due to lightning, which is approximately 17%.

The highest numbers of death occurred in 1999 due to the Super-Cyclone. Since 2003, it also suggests that there has been an increase in deaths due to lightning (see Figure 1). Lightning deaths attract less attention from the media and government, due to their isolated nature. It was further explored if there was any comparable data on lightning prior to 1999. According to the Deputy Relief Commissioner, data prior to 1999 were either not maintained or have been lost due to the Super-Cyclone. Hence, it was difficult to establish whether deaths due to lightning after 1999 are a new phenomenon or something that had always been there but remained undetected. All the seven respondents acknowledged the increasing nature of this risk on humans, especially in rural areas, but as a hazard it is still not considered of sufficient importance to implement mitigation measures. This "new risk" evades public and media attention because they cause less physical devastation compared to flooding and cyclones and the impact caused is geographically scattered, sometimes only causing the death of a single person at a time.

According to the Deputy Relief Commissioner, deaths due to lightning were explained as:

> 'farmers working in open fields despite heavy rainfall [...] or quarry workers working in mineral deposits which are often on highlands and attract lightning. [...] Sometimes people take shelter under tall trees [which are unsafe]' (22 July 2014, Bhubaneswar).

According to the Director of Indian Meteorology Department in Odisha:

> 'lightning generally happens in the afternoon. Unfortunately, weather forecasting for thunderstorm and lightning is still not robust enough to generate early warning well in advance in Odisha. The Department has to rely on the Meteorology Departments of the neighboring states of Kolkata, Patna and Vishakhapatnam. [...] the existing system is able to predict thunderstorm accompanied with lightning or sometimes hail storms only three to four hours ahead for specific districts. This lead time is often not enough to alert people who are already in the field.'

[6] The author owes a special thanks to the reviewers for their suggestions on improving the quality of the Methodology, Findings and Discussion sections.

Table 2
Disasters and deaths in Odisha from 1999 to 2013

Year	Number of deaths by disaster					
	Cyclone	Flood	Drought	Hail storm	Lightning	Heat wave
1999	10,086 (Super Cyclone)	–	–	–	–	91 (DWDNA)
2000	–	–	–	–	–	29
2001	–	102 (DWDNA)	–	–	–	26
2002	–	–	–	3	–	41 (DWDNA)
2003	–	32 (DWDNA)	–	–	222	67
2004	–	10	–	–	274	43
2005	–	13	–	1	245	199
2006	–	105	–	2	204	21
2007	–	59	–	6	331	44 (DWDNA)
2008	–	110	–	20	362	68
2009	–	59	–	5	214	89 (DWDNA)
2010	–	14 (DWDNA)	–	14	227	100
2011	–	7	–	5	360	22
2012	–	–	–	–	–	–
2013	86 (Cyclone Phailin)	37	–	–	–	–

Sources: compiled from the White Papers and Reports produced by the District Emergency Cell, Ganjam and State Relief Organization, Bhubaneswar. DWDNA = District wise data not available.

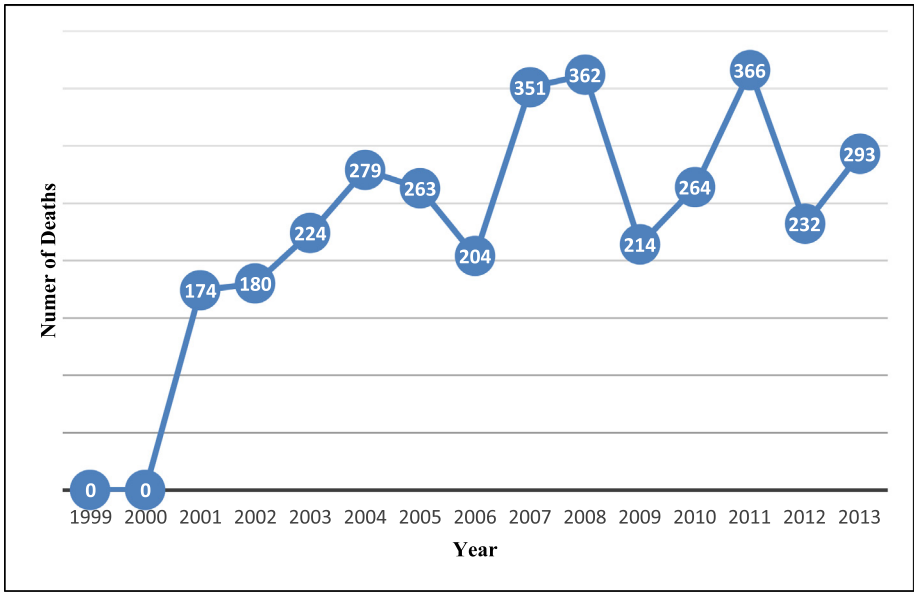

Figure 1. Lightning deaths within the four sampled districts from 1999 to 2013.

(b). Gender disaggregated mortality data

Table 3 provides the gender disaggregated mortality data from the four sampled districts: Jagatsinghpur, Cuttack, Puri, and Ganjam. Findings suggest that during the Super-Cyclone, the number of male deaths was slightly higher than the female deaths within the sampled districts. On average, this was also the case for all the other disasters that occurred in the four sampled districts from 1999 to 2013. This is also supported by Figure 2, which shows that the percentage of male deaths from 1999 to 2013 due to disasters in all the four selected districts was higher than 55%. In Cuttack district, over the years from 1999 to 2013 an average of 63% of the population deaths were male, while in Ganjam and Puri it was 58% and in Jagatsinghpur it was 57%. This clearly indicates that during the years 1999–2013, the male disaster mortality rate was higher than the female disaster mortality rate. Especially, in Cuttack the percentage of the male disaster mortality rate was consistently higher than the female disaster mortality rate throughout 1999 and 2013.

Table 3
Overall gender disaggregated disaster mortality data from 1999 to 2013

District	Male deaths	Female deaths	Total deaths
Cuttack	476 (63%)	278 (37%)	754 (100%)
Ganjam	281 (58%)	203 (42%)	484 (100%)
Jagatsinghpur	4749 (57%)	3515 (43%)	8264 (100%)
Puri	243 (58%)	176 (42%)	419 (100%)
Total	5749 (58%)	4172 (425)	9921 (100%)

Furthermore, Jagatsinghpur district (Table 3) has had the highest number of total deaths due to disasters from 1999 to 2013,

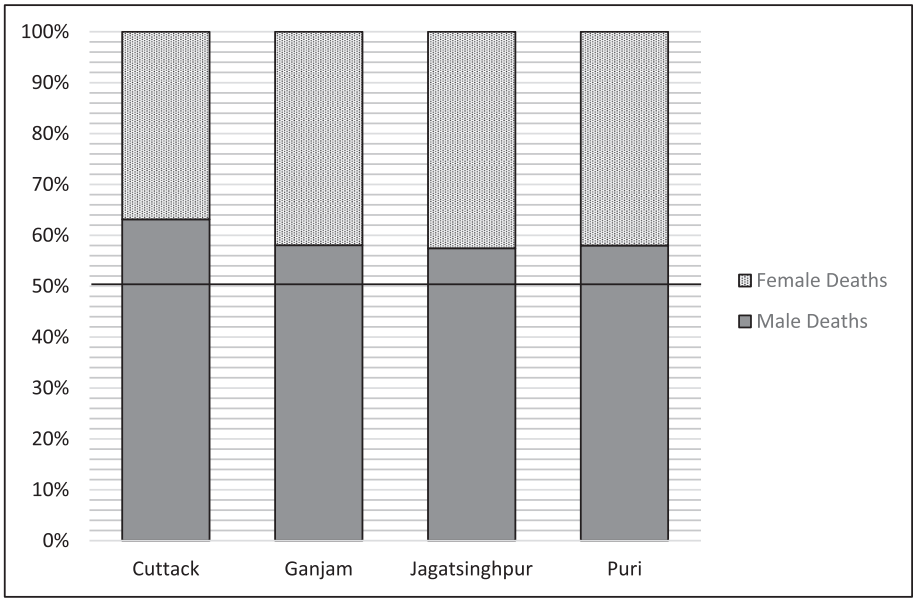

Figure 2. Gender disaggregated disaster mortality data for the sampled districts.

Table 4
Number of deaths in the four sampled districts

	Cuttack	Ganjam	Jagatsinghpur	Puri
1999	456	183	8119	301
2000	6	0	7	0
2001	8	11	2	16
2002	24	10	7	9
2003	19	22	13	6
2004	17	17	6	8
2005	36	36	19	19
2006	35	9	6	9
2007	37	22	4	7
2008	34	45	28	14
2009	14	21	6	2
2010	11	27	10	3
2011	16	27	10	8
2012	22	18	9	4
2013	19	36	18	13
Total:	754	484	8264	419
(without 1999):	(298)	(301)	(145)	(118)

which may mean that Jagatsinghpur district is more vulnerable than the other districts and it is unequally exposed to environmental risks. 83% of all deaths from 1991 to 2013 that occurred in the four sampled districts fell in Jagatsinghpur district. A large proportion of these deaths were attributed due to the 1999 Super Cyclone. Thus, if we disregard this outlier, a truer representation of the average disaster mortality rate can be obtained. With these data of 1999 removed (see Table 4), it can then be seen that Ganjam district had the higher disaster mortality rate from 2000 to 2013. However, with Ganjam district having the largest population out of the four districts (Census of India, 2011), this is to be expected. This means that all these districts have a similar percentage of deaths attributed to disasters.

6. Discussion

(a). More men died in disasters than women in Odisha

Contrary to the global data (as discussed in Section 2), this study suggests that there were more male deaths compared to female deaths due to disasters in Odisha from 1999 to 2013 (see Figure 2). Although this study was limited in identifying the socio-economic profile of the deceased, the vulnerability perspective gives a vantage point to analyze why this may be the case. As mentioned earlier, biological and physiological differences between men and women are important factors to explain survival techniques but these differences are socially determined (Eklund & Tellier, 2012). These social determinants can be equally debilitating for men in some cultures by putting them at higher risk to a hazard as this may have been the case in Odisha. In a research conducted by Ray-Bennett (2009a, 2009c) in Jagatsinghpur district of Odisha, it was noted that adolescent boys and men were at higher risk of snake bite and danger during the floods of 2001 and 2003 because the woman–headed households relied heavily on these agents for the collection of aid (food and non-food) from a public space. Men and teenage boys from all castes (upper, middle and low) took risks every day by treading across the current of flood water in order to reach the relief collection points whereas women and girls stayed at home or in an elevated area. Another study conducted by Ray-Bennett *et al.* (2010) in Cox Bazar and Matlab districts of Bangladesh noted that adolescent boys and men were more at risk of ill health during and after the floods because of their social and cultural responsibilities to look after the wellbeing of women, girls and elderly first over and above theirs.

Gender-based division of labor can be equally detrimental to men from the effect of some hazards (Kapur, 2010; Neumayer & Plümper, 2007). In agro-based economies, more men than women are employed in the agricultural sector. Odisha is no exception. These jobs in open fields make them physically vulnerable to the direct effects of lightning, heavy rainfall, cyclone and flooding. Also, the burden of patriarchy to be a breadwinner often pushes men from poor households to engage in labor despite severe weather warnings. More fishermen and male laborers were killed in the district of Jagatsinghpur in Odisha during the Super-Cyclone 1999 (Samal *et al.*, 2003). This is because people from the coastal areas rely heavily on fishing and prawn cultivation. Prawn cultivation is a labor-intensive activity and employs largely male laborers. When the Super-Cyclone made its landfall, most men were either fishing in the sea or were involved in rearing of the prawns near to the coast. Consequently, they were directly on the pathway of the Super-Cyclone. In this light, social norms and roles provide an additional layer to the biological and physiological reasons for

the gendered nature of disaster vulnerability. Women are physically weaker than men but men may be more vulnerable to certain types of disaster risks than women (Neumayer & Plümper, 2007). As such, men bore the brunt of cyclones, floods, and lightning in Odisha more compared to women.

(b). Disaster management system in Odisha

By taking a complex perspective, this study provides an additional layer to understand disaster-related deaths. For this, it is important to understand the disaster management system of India in general and Odisha in particular, a snippet of which was available in the narrative of the Director of the Meteorology Department. In the post-independence era (after 1947), the Government of Odisha inherited the colonial Famine Relief Code, which was amended in 1988 and called the Orissa Relief Code (GoO, 1996; Ray-Bennett, 2009b). Orissa Relief Code (from now on referred to as The Relief Code) was the only disaster management policy document up until 2007. Currently, it is part of the state disaster management policy.

On 1 August 2007, the Government of India passed the first "Disaster Management Act, 2005", which led to the development of a knowledge network and administrative network (Ayan, Basu, & Basu, 2015; Srivastava, 2009). To develop the knowledge network, the Government of India established the Earth System Science Observation (ESSO) to improve the weather forecasting system for hazards (Planning Commission, 2013a). It also established India's Space Research Organisation (SRO) under which the Disaster Management Support (DMS) provides near real-time support in the form of imaging and communication satellites for efficient management of disasters in India (Planning Commission, 2013a, 2013b). The National Emergency Communication Network (NECN), a sub-communication system, has also been set up with the aim "to interconnect national, state and district Emergency Operation Centres (EOCs) as well as mobile and transportable Emergency Operation Centres which can be deployed at emergency and district situation" (Srivastava, 2009, p. 70). These initiatives were pivotal in the reduction of human deaths during Phailin. Furthermore, the ongoing dialog created as part of the knowledge network between the Indian Meteorology Department, Earth System Science Observation, India's Space Research Organisation, Central Water Commission, National Geography Research Institute and National Remote Sensing Organisation (Srivastava, 2009) led to the generation of effective core information during Phailin, as well as its dissemination to the at-risk population (Director of Indian Meteorology Department, 21 and 22 July 2014, Bhubaneswar; Ayan *et al.*, 2015).

To promote an administrative network, the Planning Commission (2013b) outlined several strategies[7] in the 10th Five Year Plan which were aligned with the UN's Hyogo Framework for Action and the first ever "Disaster Management Act 2005"—mentioned earlier. According to this Act, all the Indian states were urged to set up a three-tier institutional structure in order to devolve disaster management at the national, state and district levels in the form of National Disaster Management Authority, State Disaster Management Authority, and District Disaster Management Authority. National Policy on Disaster Management (NPDM) also specified the roles and responsibilities of various organizations for disaster response. As a result, the Government of Odisha created some additional institutions at the State and District Levels which are described below' (OSDMA, 2014, p. 41). To facilitate the administrative network further, the Government of India also set up the National Institute of Disaster Management (NIDM) under the Ministry of Home Affairs in New Delhi. The National Institute of Disaster Management builds the capacity of state administrators and responders through training and support. It is also geared toward providing support to the planners and practitioners through research (Ayan *et al.*, 2015; Srivastava, 2009). To solidify this administrative network, the Government of India dedicated the 11th Five Year Plan (2007–12) and the 12th Five Year Plan (2012–17) to disaster preparedness (Planning Commission, 2013a).

This wider policy change in India led to a dramatic change in the disaster management system in Odisha. *The State Disaster Management Authority* was officially launched on 20th October 2010. The Chief Minister of Odisha is the Chairperson, the Minister of the *Revenue and Disaster Management* is the Vice Chairman, and the Chief Secretary is the Chief Executive Officer of the State Disaster Management Authority. The *Special Relief Commissioner's Office* is designated as the secretariat of the State Disaster Management Authority. The Special Relief Commissioner is the additional Chief Executive Officer. The State Disaster Management Authority has the responsibility for laying down policies and plans for disaster management State Executive Committee (OSDMA, 2014).

The State Executive Committee was constituted to assist and support the coordination for the State Disaster Management Authority. The State Executive Committee is responsible for implementing the National Plan and the State Plan. It is also responsible for coordinating and monitoring the management of disasters and also in charge of the State Disaster Response Fund (OSDMA, 2014).

The Department of Revenue and Disaster Management is the administrative department for the management of disasters. The Special Relief Commissioner is in charge of the response phase of disasters, whereas the *Odisha State Disaster Management Authority* deals with preparedness and mitigation aspects. The Odisha State Disaster Management Authority also provides support to the Special Relief Commissioner during the response phase (OSDMA, 2014).

A *District Disaster Management Authority* is constituted in all districts to oversee Disaster Management activities at that level. The Collector is the Chairperson of District Disaster Management Authority whereas the Chairman, Zilla Parishad is the Co-Chairperson. The Superintendent of Police, the Chief District Medical Officer and Executive Engineers in charge of embankments, Assistant District Magistrate in charge of Emergency, Executive Engineer for Rural Development Department, Project Coordinator for District Rural Development Authority, and Deputy Director for Agriculture Department are the Members of District Disaster Management Authorities (OSDMA, 2014). The Collector is also the District Relief Officer and Disaster Manager. A block is the lowest unit of relief administration. Block Development Officers and Tahasildars jointly manage relief administration at the lowest level.

The *Natural Calamity Committee* functions under the chairmanship of the Chief Minister for overall supervision and monitoring at the state level. At the district level, the *District Natural Calamity Committee* along with District Disaster Management Authority functions with representation from district level officers and peoples' representatives under the chairmanship of the district Collector for supervision and monitoring. Block Disaster Management Committees (under the chairmanship of the Chairperson, Panchayat Samiti), Gram Panchayat Disaster Management Committees (under the chairmanship of the Sarpanch[8]) and Village level Task Force Committees have been constituted in the programed areas

[7] Some of the strategies include: (i) policy guidelines on preparation of developmental plans; (ii) a multi-pronged strategy for risk management; and (iii) the recognition of a need for planned expenditure on disaster management and preventive measures in addition to the National Calamity Relief Fund (Planning Commission, 2013b).

[8] Sarpanch is an elected village chief.

(16 districts) under the Government of India-United Nations Development Programme (GoI-UNDP) Disaster Risk Management program (DRM) for day-to-day management of disasters and risk reduction measures (OSDMA, 2014, p. 43).

Although Odisha's State Disaster Management Plan does not specify the role and involvement of the *Indian Meteorology Department* in disaster management, in the context of this research and also to reduce deaths, the role of this Department is vital. The Indian Meteorology Department belongs to the Government of India. The purpose of this Meteorology Department is to provide support to the state departments by generating effective early warning information for future planning and disaster response. Evidence of this was cited above.

In light of these devolved organizational arrangements and the complex web of actors (a compilation of this is provided in Table 5), it is worth questioning (i) who is accountable to save precious lives, and (ii) how do deaths get reported? This is explained below.

Table 5
Actors/Organizations involved with disaster management in Odisha

Actors/Organizations	Typology of actors
Revenue and Disaster Management Department	Category 2
Special Relief Organisation	Category 2
Odisha State Disaster Management Authority	Category 2
State Disaster Management Authority	Category 2
The State Executive Committee; Natural Calamity Committee	Category 2
District Disaster Management Authority	Category 1
Block Disaster Management Committees	Category 1
Gram Panchayat Disaster Management Committees	Category 1
Village Level Task Force Committees	Category 1
Indian Meteorology Department	Category 2
United Nations Development Programme	Category 3
Government of India	Category 2

(c) Who is accountable to save lives?

From the interviews with the Indian Meteorology Department in Odisha, it was identified that this Department does not generate "core" information or early warnings tailored to the at-risk community and, as such, they are not accountable for saving lives directly. Their target groups include the Special Relief Organisation, United Nations Development Programme Office, District and Block Level Disaster Management Authorities, the departments of fisheries, agriculture, railway, aviation and navigational advisories, defense and spacecraft launching services and expeditions related to the Antarctic and pilgrimage (Indian Meteorology Department/Odisha, 2014; Director of Indian Meteorology Department, 24 July 2014). The Special Relief Organisation on the other hand, while they are the lead organization to activate the district disaster response system by generating a weather alert, also does not target the at-risk community directly. Instead their target groups are the District Collectors, the Odisha State Disaster Management Authority, Block Development Officers, Tahasildars, and District Emergency Officers. While interviewing the three District Emergency Officers, it was found that the response system in the districts, blocks and villages are responsible for evacuating and rescuing the at-risk community. But if the response system fails to prevent deaths, the disaster management system according to the Relief Code is not designed to penalize or make the responders accountable for their failings.

However, in lieu of an accountability system, alternative practices which can make the system indirectly accountable for the affected people in Odisha are in place. These are general elections and political leadership and second, a culture of compensation. According to Mudur, Mishra, and Mohanty (2013), Chief Minister Mr. Giridhar Gamang failed in the leadership he provided during the time of Super-Cyclone in 1999. The consequence was that Mr. Gamang and the Indian Congress Party were ousted from Odisha. This lack of leadership during the Super-Cyclone was taken as an opportunity by the opponent leader Mr. Naveen Patnaik to win the election in 1999. Since then Mr. Patnaik provided much needed leadership in the state. From 2000, he started observing a state-level "Disaster Preparedness Day" on the 29th of October each year. He also concentrated much of his effort in building the infrastructure of his state—an effort that is essential to supporting a disaster response system. This is thanks to the funds available from the World Bank and the central government in order to build roads, bridges, concrete houses, multi-purpose cyclone shelters, schools, and the like (State Programme Officer of United Nations Development Programme Office, 23 July, 2014; Ayan *et al.*, 2015; Ray-Bennett, 2009a). On 12th October 2013 when Odisha was hit by yet another powerful cyclone called Phailin (260 km/h) good road conditions, as well as their connectivity with the cyclone shelters, facilitated the evacuation of more than 1.2 million people from 18 districts (State Programme Officer, United Nations Development Programme Office, 23 July 2014; Deputy Relief Commissioner, 22 July 2014; Ayan *et al.*, 2015; Harriman, 2013).

He also exhibited the traits of a strategic leader by developing a "shared vision" (Senge, 1990) or "a goal" (Jenkins, 1969) of "saving precious lives" for all actors involved in mitigating the effects of Cyclone Phailin. This is explained in the words of the Deputy Relief Commissioner of the Special Relief Organisation.

> *If you take the case of Phailin, we got official information on 7th evening. From 8th there were constant coordination meetings and reviews at the level of Chief Secretary and the Chief Minister for the next 4 to 5 days [...]. **Our Chief Minister [...] suggested life is precious and we must save them [...]** [author's emphasis].*
> **[(22 July 2014, Rajiv Bhawan, Bhubaneswar).]**

To implement the Chief Minister's order, the Special Relief Commissioner conveyed the goal of a "zero casualty" to all the responders in the district, block and village levels, which became a "mission statement" for the state machineries (OSDMA, 2014). Since the main objective of the disaster management system during Cyclone Phailin was geared toward achieving "zero casualty" at any cost, it was noted that such a system was beneficial for vulnerable groups. Women, children, and elderly people were evacuated first according to the three District Emergency Officers.

> *Life is precious. We wanted to save all lives. **R: In Ganjam in particular we found that actually less women died in disasters**. Actually women were the first who came out from their villages [...]. They told 'we will go to shelter houses to save our lives'.*
> **[(Former District Emergency Officer of Ganjam District, 24 July 2014, Revenue and Disaster Management Department, Bhubaneswar).]**

> *This time what happened, we have taken care of pregnant women and girl children. We have instructed the field employees like the Tahasildar, BDOs (Block Development Officers), Gram Sevak (village worker) Asha Karmi on this [...]. I told them categorically women and children must be our top priority and then old men. And we should take help of the youth for protecting [...] relief camps [...].*
> **[(District Emergency Officer of Jagatsinghpur, 29 July 2014, Swosti Lounge, Bhubaneswar).]**

The narrative of the District Emergency Officer of Jagatsinghpur in particular suggests that the field level responders were given strict instructions to evacuate women and children first. These instructions were facilitated by the decision taken by the Special Relief Commissioner to enforce the Clause 34(C) of the "Disaster

Management Act 2005" in the event of Phailin. This particular clause gave power to the district and local level responders to evacuate people "by force" if needed (Mishra, 2013). The remarkable success in reducing deaths in Phailin heightened Mr. Patnaik's popularity among his electorates, which led him to win his fifth election as Chief Minister of Odisha.

Culture of compensation: According to the State Programme Officer of the United Nations Development Programme Office, the current disaster management practice is built upon a rights-based approach—one in which "*people's dignity are respected in terms relief and rehabilitation*". This approach has created heightened awareness among the "*average Odiya person even in the rural areas with regard to response and preparedness*" (State Programme Officer, United Nations Development Programme Office, 23 July 2014) and also about their "*entitlements*" through compensation (Deputy Relief Commissioner, July 2014). Although a deceased person is irreplaceable, compensation enables the state government to acknowledge the event violence that occurs during disasters. Although the idea of event violence presented earlier is concentrated primarily around the failure of the disaster response system to protect lives, this was conceived differently in some cases by the participants. An example is cited in this instance:

> *The first death in Bhubaneswar occurred around 12.0 pm on 12th because the person came out of home to pluck flowers. A branch fell on her. That was the first death. How can we prevent such death? During cyclonic condition why she should come out to pluck flowers instead of remaining indoors.*
>
> **[(Deputy Relief Commissioner, Special Relief Organisation, 22 July 2014, Rajiv Bhawan, Bhubaneswar).]**

The context of this death can be examined with a cultural lens highlighting the role of an individual's behavior. Almost all Odiya households pray to their gods every morning. Household members, largely women and young girls, offer prayers, flowers, and sweets to the gods. This is known as *Prasad* or an offering. The day Cyclone Phailin was to make a landfall was no exception. This particular individual came outdoors to pick flowers and it was during this act that the branch of a tree fell on her and caused her death. According to the Deputy Relief Commissioner this was a self-inflicted death and not due to the failing of the response system. The disaster response system generated repeated weather warnings and alerts, which were disregarded by this particular individual. This anecdote suggests that compensation is not enough; raising awareness, behavior change information, education and communication materials, and training are equally vital to reduce deaths.

(d) How deaths get recorded?

Deaths[9] due to disasters are of two types: primary or direct and secondary or indirect (IRDR, 2015; Ray-Bennett, 2010). Any deaths caused by the direct impact of disasters are called "primary deaths". These deaths are far more widely reported than "secondary deaths". Secondary deaths are a consequence of injury or morbidity arising from the impact of disasters. These are the most contentious deaths (Ray-Bennett, 2010) and are often not recorded. In Odisha, death reporting and verifications are strictly followed by the guidelines identified in the Relief Code. According to the Relief Code, compensation is hazard specific. For instance, Indian Rupees (INR) 100,000 (approximately GBP 1,025) is payed for a death due to cyclone; INR 150,000 (approximately GBP 1,500) due to lightning; INR 10,000 (approximately GBP 100) due to heat wave; and INR 100,000 (approximately GBP 100) due to a snakebite during floods (GoO, 2014). Compensation is offered (regardless of the deceased's caste, class, or gender) to their next of kin. But the compensation is subject to a death certificate being issued by the local government doctor who verifies the cause of death: either primary or secondary. A compensation package is then approved by the District Collector for primary deaths (GoO, 1996, 2014).

The death reporting system is highly revealing. It was identified that disaggregated mortality data by caste are filtered out at the block office level, whereas class and gender data are filtered at the district office level. This is because according to the Relief Code compensation is not tied to an individual's class, caste, or gender. Caste data are lost at the block office because the proforma designed for the local government doctor to issue a death certificate due to disasters (primary death) does not require caste to be specified. Class and gender data are lost at the district office when it is sent by the block office for further verification. As a result, the Odisha State Disaster Management Authority and the Special Relief Organisation, the two relevant state offices in Bhubaneswar who compile data, receive caste, class, and gender neutral mortality data.

Since official death records were an important part of this research, the author was skeptical of the reliability of these records and the record keeping practices of the government. According to Yin (2012), records can be manipulated by under-reporting or under-counting by the block or district governments and this could be the case in Odisha when there is a compensation attached. Furthermore, the timing of the death report is of further concern. The details of the death must be reported within 24 h according to the Relief Code (District Emergency Officer of Jagatsinghpur, 29 July 2014). In reality, the whole process takes longer. Unfortunately, it was not possible to verify the death records by visiting the hundreds of villages in the sampled districts. This was beyond the scope of this research. While this did present a limitation in this phase of the research, efforts were made to explore the reasons why women's or men's deaths could be under-reported by asking the expert interviewees. Their responses were that it is unlikely women's deaths or even any death cases could go un-reported because of the hyper-connected society that we live in. Today's society is connected by media and communication tools. These tools have made it difficult to hide facts such as disaster-related deaths. The former District Emergency Officer of Ganjam is quoted in this instance:

> *Things have changed because you know you cannot hide anything, media is everywhere. Media is very strong nowadays. [...] almost 100 media people are working in my area [...] including remote areas too. We cannot hide anything in this present era [...]. Besides why people will suppress death? They get lakhs of rupees (100,00.00 rupees).*

The responses from the other respondents were similar. Furthermore, motivation to receive compensation should avert under-reporting of deaths according to the respondents.

7. Conclusion

In order to reduce deaths overall, and men's deaths in particular, in Odisha, it is recommended that the disaster preparedness programs are geared toward men's and boys' needs. Although the myriad of capacity building programs for the at-risk communities has led to a 'culture of disaster preparedness' (OSDMA, 2011, 2012), this preparedness has been at best gender-neutral or, to some extent, women/girl sensitive due to their increased vulnerability. To reduce men's deaths, it is important that the government initiates customized-programs to educate the fishermen, quarry

[9] Deaths is defined as "number of people who lost their life because of the event happened". The number of deaths does not include indirect or secondary deaths and missing persons (IRDR, 2015).

workers, laborers working in prawn rearing, and small farmers about early warnings and the risks associated to different hazards to their lives and livelihoods. The state government could also provide incentives to these vulnerable groups in the form of food rations at a subsidized rate through the Public Distribution System, to encourage them to stay at home on days when the forecast weather is severe (Ray-Bennett *et al.*, 2016).

In order to reduce deaths from lightning, the Government of Odisha should aim to improve its early warning systems (Director of Indian Meteorology Department, 24 July 2014). For this, more funding from the Government of India and investment in science and technology is needed to improve the localized early warning systems. It is also important to improve the communication channels to reach the poor and vulnerable who take risks on rainy or sunny days to earn their livelihoods. Lightning arresters, lightning conductors, stronger infrastructure, and raising awareness are other tools that the Government of Odisha should consider introducing in rural locales. The Government of Odisha should also undertake a risk assessment to map the number of buildings, houses, schools, and hospitals that are exposed to lightning in rural locales (UN, 2015). Government and non-governmental organizations should also aim to introduce behavioral change information, education, and communication materials (e.g., educating locals that when it rains and they are in an open field with only one tall tree, it is not safe to take shelter under that tree) to arrest deaths from lightning. Currently, there has been very little effort or action to mitigate the effect of this hazard in Odisha. Due to the increase in global temperature, meteorologists believe that lightning and thunderstorms will become more common; killing more people in the developing world (Khadka, 2014; WMO, 2017b). It is therefore extremely important that the UN, along with the national and state governments, make concerted efforts to highlight the risk of this hazard and promote measures that the developing countries can afford to mitigate its effect.

The death reporting and recording system merits review in Odisha in light of the Sendai Framework.[10] Recently, the Sendai's Policy Brief (Fakhruddin, Murray, & Maini, 2017) developed by the International Council for Science and Integrated Research on Disaster Risk (IRDR), suggested "[e]stablishing basic data infrastructure for disaster loss data in developing countries and supporting regional and global cooperation for disaster loss reporting". In light of this, some concerted efforts are required to develop such infrastructure at regional, national, state and district levels in India and the SAARC region. It is also important to make the disaster loss data management consistent with the Guidelines identified by IRDR (2015) on "measuring losses from disasters". For this, the Government of Odisha should aim to document not only primary deaths, but also secondary deaths and those who are missing (Dilley & Grasso, 2016; IRDR, 2015).

Although it was beyond the scope of this research to capture people's perspectives on Odisha's death reporting system, it is likely that deaths could go un-reported - not by the beneficiaries but rather due to the verification process carried out by the government doctor at local government hospitals. This verification process merits further investigation. It is also important to address the death reporting practices in India in order to standardize this system, (Dilley & Grasso, 2016; Fakhruddin *et al.*, 2017) and introduce good practices in order to improve the accuracy of disaster death data. To be consistent with the Sendai Framework it is also recommended that that the Government of Odisha record disaggregated data. This is not currently expected according to the Relief Code. In order to promote gender disaggregated mortality data, the UN's International Strategy for Disaster Risk Reduction and Integrated Research on Disaster Reduction can take a lead role, in association with the national governments and the United Nations Development Programme. In India, the National Institute of Disaster Management in New Delhi and the Odisha State Disaster Management Authority in Odisha, along with United Nations Development Programme can undertake this venture. Longitudinal death records at local, national and global levels will be extremely important to indicate past and future death patterns in disasters. They will also promote necessary policy, planning, and response by guiding how and where the finite resources of disaster risk reduction could be better placed to reduce human deaths or change human behaviors.

Lastly, conceiving "deaths in disasters" through the lens of the complex perspective should promote an accountable disaster management which is still in its nascent stage in Odisha. It should also help to identify gaps (such as no measures for lightning) that often exist at the seams of human-built disaster management systems. This is because the complex perspective allows us to redirect our attention to the actors' and organizations' actions and inactions to prevent deaths, rather than focusing solely on the severity of a risk and the vulnerabilities that exist among the at-risk community. When we are able to better comprehend the vulnerabilities of the disaster management system, it is more likely that we will be able to come up with concrete solutions and develop the skills, knowledge, and expertise that will be required for the actors and organizations to reduce deaths, such as men's deaths and deaths from lightning in the case of Odisha.

[10] The author owes a special thanks to one of the reviewers for directing her to look into Sendai's death strategy.

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